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WILDLAND VEGETATION RESOURCE INVENTORY

INTERIM STATUS REPORT FOR MANAGEMENT

by

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Denver Service Center

Denver, CO

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BLM EXPENDITURES FOR REMOTE SENSING PROGRAM AT DSC
(costs are shown in thousands of dollars)

Item	FY 1977	FY 1978	FY 1979	Total
Equipment	46.0	-	20.4	66.4
Geology Program	-	24.3	-	24.3
Image Analysis System	-	339.9	140.9	480.8
MOU with EROS	-	60.0	60.0	120.0
Output Products	5.6	-	30.0	35.6
Personnel (permanent)	64.6	93.6	96.0	254.2
Personnel (temporary)	22.2	3.6	19.0	44.8
Photography (large scale)	20.4	35.6	50.0	106.0
Photography (resource)	14.8	-	6.0	20.8
Soils Program	-	-	27.7	27.7
Remote Sensing Training	47.4	49.2	127.5	224.1
Travel	32.0	28.9	38.0	98.9
Miscellaneous	6.0	7.0	8.0	21.0
Total	259.0	642.1	623.5	1524.6K

NASA EXPENDITURES FOR REMOTE SENSING PROGRAM WITH BLM
(costs are shown in thousands of dollars)

Item	FY 1977	FY 1978	FY 1979	Total
Contracts	399.6	260.0	149.9	809.5
Personnel	45.0	45.0	45.0	135.0
Resource Photography	27.0	9.0	20.0	56.0
Total	471.6	314.0	214.9	1000.5K

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1.0 Introduction

The purpose of this report is two fold. First to up date BLM management level personnel on the current status of the BLM-NASA remote sensing program. Second to review the status of phase 1 output products for Alaska.

In order to accomplish these objectives this report is broken into several sections. One section each will be devoted to (a) the Alaska Test Site - Phase 1, (b) the Arizona Test Site - Phase 2, (c) the Idaho Test Site - Phase 3, and (d) the BLM Digital Image Analysis System. In addition because of the importance and prominence of the Phase 1 output products, a major section in this report is devoted to this subject.

2.0 Alaska Test Site - Phase 1

Work in the Alaska Test Site was accomplished by a team of BLM specialists working in close coordination with a contractor. The contractor, ESL, Incorporated, was under contract to NASA to accomplish a vegetation classification for the Alaska Test Site and to develop selected geologic maps of the area. Since this was the intial phase of the program, extensive formal training was provided BLM personnel from Alaska State Office, Anchorage District Office, and SSD Denver Service Center, as part of the contract. In addition a considerable amount of on the job training was provided. This was primarily accomplished by BLM personnel working directly with contractor personnel both in the field and at the contractor's facility. Active work on Phase 1 was accomplished in the period from May 1977 through June 1978.

2.1 Analysis

The analysis of remote sensing data for the Alaska Test Site was divided into four sections as follows: analysis of Landsat digital data, analysis of Landsat photographic data, analysis of aerial photography and interpretations for geologic information.

2.1.1 Landsat Digital Data

A very detailed plan was developed for processing of the Landsat digital data. This plan utilized a basic manual stratification of a Landsat color composite for the eventual allocation of field plots and large scale photos. Because of the area's remoteness and lack of transportation net, as well as cost and time constraints certain limitations were built into the sampling scheme for field work and large scale photography. The large scale photos and ground data were used in a multilevel sampling approach to better define the composition and type of the Landsat strata generated by digital analysis. In all there were 93 ground plots visited and 4500 photo plots were interpreted. The resulting information was entered by coordinates into a geographic data base and was thus available for supporting the Landsat digital interpretations. Using this technique vegetation classifications were developed for three Landsat scenes covering the test site. These scenes are as follows: Landsat scene #1268-20351 (August 30, 1974), Landsat scene #2169-20275 (July 10, 1975), and Landsat scene #5470-19560 (August 1, 1976). As a result of this approach extensive information which could not have been derived from Landsat data alone was obtained for each vegetation type defined by the BLM resource specialist. An example of this level of information is contained in the Appendix.

2.1.2 Landsat Manual Interpretation

In order to assess the value of vegetation type data interpreted from Landsat hardcopy color composites, three Landsat products were manually interpreted. The August 30, 1974 (1268-20351) Landsat scene was interpreted from two different hardcopy products. The first product interpreted was a standard product produced by EROS Data Center (EDC). The second product interpreted was a geometrically and radiometrically corrected and enhanced version of that product (EDIES product). The August 1, 1976 (5470-19560) Landsat scene was interpreted using the standard product from EDC. Results of these interpretations revealed that, while the level of detail was less than that obtained from a digital product, these products could frequently be used to obtain initial land cover information to a level of detail that exceeds some existing maps in BLM. It was also reported that the enhanced products were more interpretable than standard products. Cited as advantages were decreased mapping time, increased confidence in the resulting maps, easier delineation of boundaries, and less revision was required.

2.1.3 Interpretation of Aerial Photography

Part of the objectives of this program are to determine the suitability of using aerial photography as a data source ~~for~~ when greater detail, than that available from Landsat, is required. Consequently NASA obtained Color Infrared (CIR) photography of the entire test site at a scale of 1:120,000 and CIR photography over nine specially selected intensive mapping areas (IMA) at a scale of 1:30,000. The IMA's ranged in size from 62 square kilometers (24 square miles) to 109 square kilometers (42 square miles). Selected portions of the 1:120,000 scale photography were photo interpreted and all nine of the IMA's were photo interpreted. Several different aggregation units were used in the interpretations.

2.1.4 Geologic Interpretations

In this project Landsat hardcopy photographic products and aerial photography were interpreted for selected portions of the test site. Four aspects of geology were investigated: (a) bedrock geology, (b) lineaments, (c) geomorphologic features, and (d) environmental hazards. Twenty-five separate overlays portraying the

latter four geologic features were generated. A thorough report on this aspect of the program was also prepared and will be published separately from the overall report.

2.1.5 Evaluation

An integral part of this program was to conduct an evaluation of the products. This evaluation has three aspects: (a) a statistical verification of all vegetation products, (b) a field evaluation of all products by resource specialists, and (c) a cost analysis. With the exception (as noted) of geology products, all products were statistically verified using either contingency analysis, analysis of variance (ANOVA), or regression analysis. Evaluation using these statistical models were conducted for the following:

1. Map products with different mapping minimums,

2. Area estimates for cover types with associated confidence statements,

3. Estimates of mean value with associated confidence statements for

   (a) per cent cover,

latter four geologic features were generated. A thorough report on this aspect of the program was also prepared and will be published separately from the overall report.

2.1.6 Evaluation

An integral part of this program was to conduct an evaluation of the products. This evaluation has three aspects: (a) a statistical verification of all vegetation products, (b) a field evaluation of all products by resource specialists, and (c) a cost analysis. With the exception (as noted) of geology products, all products were statistically verified using either contingency analysis, analysis of variance (ANOVA), or regression analysis. Evaluation using these statistical models were conducted for the following:

1. Map products with different mapping minimums,

2. Area estimates for cover types with associated confidence statements,

3. estimates of mean value with associated confidence statements for

   (a) per cent cover,

(b) species composition per computer class,

(c) photo interpretation category by mapping minimum.

A field evaluation was conducted to evaluate the manual interpretation of Landsat and photo interpretation of aerial photographs. This field evaluation was conducted by Anchorage District Office personnel. A report is in preparation by Alaska and is expected to be published in the near future. A field evaluation of the digital products from Landsat was not conducted because all of these products were rejected upon delivery. These products are currently being remade and will be discussed in detail in another section of this report.

A cost analysis of all products has not yet been completed. The data on this task, presented by the contractor, was inadequate. Consequently a complete revision of the cost section is required. This will be accomplished by SSD personnel in the coming months. A very careful and detailed analysis of cost for these products will be developed. In lieu of this specific cost data, some initial cost data is presented in Figure 1. While this data is not final it is considered to be reasonably accurate and thus valuable for planning purposes.

3.0 Arizona Test Site - Phase 2

The program in Arizona was subdivided into two parts. Part 1 is a mapping program conducted in cooperation with EDC. This program is known as the Arizona Vegetation Resource Inventory (AVRI) project. In this part of the program Landsat digital data are analyzed for vegetation information, Landsat hardcopy photo products and aerial photographs are interpreted. Part 2 is an inventory program in which multistage sampling techniques are being applied. Part 2 of this project is being accomplished by ESL, Incorporated through a NASA contract. The end products associated with Part 2 are production figures for timber, woodlands, and range. Active work on Phase 2 was initiated in March 1978 (Part 1) and is expected to be completed in January 1980 (Part 2).

3.1 Part 1 Mapping Program

The BLM has been working with EDC to accomplish this part of the Phase 2 program. In essence there are three major tasks involved: analysis of Landsat digital data, interpretation of Landsat photographic data, and interpretation of aerial photographs.

Cost Comparison

Conventional Aerial Photo Inventory vs Landsat Inventory

Type of Data	Scale of Data	Mapping Minimum (Acres)	Interpretation Cost ¢1 acre	Cost to Input into digital base ¢1 acre	Total Cost (2 million acres)
Aerial Photos	1:30,000	5.0	4.0	2.0	$120,000
Aerial Photos	1:30,000	40.0	3.0	1.3	$ 86,000
Landsat	Independent	1.0	0.5	0.0	$ 10,000

3.1.1 Landsat Digital Data

Using a digital stratification of Landsat, field plots and aerial photo plots were allocated. Because of limitations on available manpower and costs, the total number of field plots and aerial photo plots were limited. The ground data and aerial photos are being used in a two stage-double sample scheme to better define species composition information associated with the digitally produced Landsat strata. There were a total of 7000 photo plots and 67 ground plots. These were distributed among the strata on the basis of probability proportional to area. The data collected on the ground and interpreted on the photos will be entered into a geographic data base for supporting the Landsat digital strata. One vegetation map for the test site will be produced. This map will be radiometrically and geometrically corrected and registered to a 50 meter UTM grid. The data will also be combined with digital terrain data. The scene used for this activity is the Landsat scene #947-17074 (August 26, 1977). A final vegetation map product is expected to be available in May, 1979. The final report on the AVRI project will be completed in November 1979.

3.1.2 Landsat Manual Interpretation

As previously cited in Section 2.1.2 it is desired to assess the value of a product generated from manually interpreting a Landsat hardcopy product. The August 26, 1977 (947-17074) scene was selected for this task. Two interpretations are required: (1) interpretation of a standard product as produced by EDC, and (2) interpretation of a geometrically and radiometrically corrected and enhanced version of that product (EDIES product). At this point the standard product has been interpreted and work has been initiated on interpretation of the enhanced product.

3.1.3 Interpretation of Aerial Photography

In this phase of the project NASA has once again provided CIR photography to BLM. This photography was collected at a scale of 1:120,000 over the entire test site, at a scale of 1:60,000 over approximately 2/3 of the test site, and at a scale of 1:30,000 over 11 Intensive Mapping Areas (IMA).

The 1:120,000 scale photos over selected areas are being interpreted by EDC. The 1:60,000 scale photos over the 11 IMA's have been interpreted by DSC, and the 1:30,000 scale photos over the 11 IMA's are being interpreted by the Arizona Strip District.

3.2 Part 2 Inventory Program

This part of the Phase 2 effort is being conducted through a NASA contract with ESL Incorporated. There are three tasks associated with this effort: (1) develop production data over selected allotments for forage information, (2) develop production data for selected stands for timber, and (3) develop production data over selected allotments for woodlands.

3.2.1 Analysis

In order to develop the required production information for this phase of the program, a multistage sampling concept has been developed. For the range portion of the program a two stage sample using Landsat and ground data will be employed. For the timber and woodlands portion a two stage-double sample using Landsat, large scale photos, and ground data will be employed. Large scale photos were initially allocated via a manually stratified Landsat product. This data with its attendent ground data collected in 1978 is currently being employed to digitally stratify the August 26, 1977 (947-17074) Landsat scene into production classes. Once this basic stratification is accomplished, additional

large scale photo plots and ground plots will be allocated. It is anticipated that there will be 3000 photo plots and 180 ground plots for this effort.

The ground data and large scale photo data will be combined with the Landsat digital strata through a geographic data base. Included in this data will be actual weight estimates gained on the ground via clippings, and occular estimates. Using a statistical analysis, production information will be generated for range, woodlands, and timber.

3.3 Evaluation

It is also required in this phase of the project to conduct an evaluation of the products generated. This particular evaluation will consist of the following:

1. A statistical verification of the products,

2. A field evaluation of the products, and

3. A cost analysis.

Plans are currently being developed to accomplish items 1 and 2. Item 3 is an extremely important requirement. Very detailed cost data are currently being kept on this phase of the project.

3.4 Geology

The geologic mapping effort in this phase of the project is being accomplished through a BLM contract with Fugaro, Inc. Landsat hard copy photographic products and aerial photographs are being interpreted. The thrust of the effort is to map landform, hydrology, geomorphology, and lithology.

4.0 Idaho Test Site - Phase 3

This phase of the program was initiated in October 1978. The effort is being conducted cooperatively with EDC and is known as the Idaho Vegetation Resource Inventory (IVRI) Project. Both mapping and inventory data will be obtained. The initial Landsat digital data analysis will be accomplished by DSC and Boise District personnel working at EDC, Sioux Falls, SD. Production data will be obtained for range only in this phase of the program. It is planned to complete the work on this portion of the project in September 1980.

4.1 Analysis

The analysis of remote sensing data for the Idaho Test Site is divided as follows: analysis of Landsat digital data for mapping and inventory, analysis of Landsat photographic data for mapping, analysis of aerial photographs for mapping, and analysis of Landsat digital data for soils mapping. The Landsat scenes 3012-717472 and 3012-717475 (July 10, 1978) have been selected for this project.

4.1.1 Landsat Digital Data - Mapping and Inventory

Beginning in March 1979 a digital stratification of the Landsat data will be initiated. This basic stratification will be completed in late May. Using the stratification,

ground plots and large scale photo plots will be allocated. The total number of plots will be determined after the stratification is complete. The Landsat digital data will be geometrically and radiometrically corrected, and registered to a 50 meter UTM grid. Digital terrain data will also be joined with the Landsat data. Finally existing soils maps will be digitized and entered into the Landsat data base.

In order to insure understanding at the District level a special training session in digital analysis will be held in February in Boise. This session will be conducted by EDC. Following this session DSC and District personnel will begin the basic stratification at EDC in early March.

4.1.2 Landsat Manual Interpretation

A vegetation map of the test site will be prepared from a manual interpretation of a Landsat color composite. A standard product from EDC shall be interpreted. This task will be initiated in February 1979. In addition once the BLM IDIMS system is installed an enhanced product shall be produced and interpreted.

4.1.3 Interpretation of Aerial Photographs

NASA will collect CIR photography over the test site on two different dates. The first set of photography is scheduled to be collected in late April. The second set is to be collected in early July. Photography at a scale of 1:120,000 will be collected over the entire test site. Approximately 2/3 of the site will be covered by 1:60,000 scale and a yet to be finalized number of IMA's will be covered by 1:30,000 scale photographs. The aerial photographs will be interpreted by DSC and Boise District. DSC will interpret the 1:120,000 scale photographs and Boise District will interpret the 1:60,000 and 1:30,000 scale phototgraphs.

4.2 Evaluation

As in previous phases of this project, an evaluation of the products generated shall be conducted. Plans will be developed to conduct this evaluation in the spring of 1980. The evaluation shall consist of the following:

1. A statistical verification of the products,

2. A field evaluation of the products, and

3. A cost analysis.

4.3 Soils

A major effort is being devoted to the mapping of soils as part of the phase 3 effort. The purpose of this effort is to develop a soils map of a portion of the test site from the Landsat digital data. The advantage of developing a soils map directly from Landsat (rather than simply digitizing a soils map made from another data source) is that the map is already in a digital form and part of the Landsat data base. An extensive effort in this area has been initiated by BLM at the Laboratory for the Applications of Remote Sensing (LARS) at Purdue University. BLM has placed a person in residence at LARS to accomplish this effort. Initial digital analysis has begun and a basic soils stratification will be completed in late March. This stratification will be field checked and revised. In the end a soils map produced from Landsat digital data will be completed in the September - October 1979 time frame.

5.0 Digital Image Analysis System

A contract was negotiated with ESL, Inc. in FY 1978 to acquire an Interactive Digital Image Analysis System (IDIMS). This system is being delayed in delivery because of requirements by GSA to make major modifications to the room in which the system is to be installed. It is anticipated that these modifications will be completed in August. In the meantime extensive training has been scheduled to be provided to BLM personnel on the IDIMS system to be installed at the Bureau of Reclamation facility in Denver.

Once the facility in Building 50 at DSC has been remodeled, installation of the BLM IDIMS will begin. It is anticipated that this will occur in the September time frame. Assuming that this occurs as anticipated, and assuming that the number of problems associated with the system's hardware and software are minimal, it is expected that the BLM system will be operational in the January 1980 time frame.

6.0 Output Products

Because output products are the criteria by which the program will be assessed, this section is devoted exclusively to them. In addition the phase 1 output products as originally delivered were substandard and consequently rejected by BLM and NASA. As a result a number of questions about the overall success of the program have been justifiably raised by numerous persons. In many instances the questions were based on a lack of real knowledge about the program and the products but in all cases the questions were legitimate. This latter statement is made as an acknowledgement and further proof of the fact that the success of the program can only be gaged by an assessment of high quality, meaningful output products. The purpose of this section of this report is to inform BLM management of the steps which have been taken to correct the problems inherent in the original output products, and to reveal DSC plans for handling these products in the future.

6.1 Phase 1 Products (Alaska Test Site)

When this project was initiated one of its early objectives was to obtain a large variety of products. The purpose of acquiring this cross section of product types was to provide BLM the opportunity (1) to obtain a greater knowledge of what could be accomplished in this area, (2) to assess the value of each of the different products for use within the BLM operationally, and (3) to demonstrate the great versatility of

digital inventory data. Consequently numerous different types of products were specified as part of the phase 1 NASA contract. In this section of the report the products produced from the digital analysis of Landsat data will be discussed. Products produced from the manual interpretation of Landsat and photo interpretation of aerial photographs have been accepted as being within the terms of the contract and were evaluated in the field in August 1978.

6.1.1 ESL, Incorporated Products

In July 1978 ESL delivered a complete set of output products to NASA at Johnson Space Center (JSC) Houston, Texas. Personnel from BLM Alaska and DSC inspected those products in Houston and found most of them to be unsatisfactory. ESL was notified via Telecon of these findings at that time. The balance of the products were taken to Alaska where extensive tests were conducted to determine if they met the basic government specification. It was found that none of these products were within tolerance and as a result the remaining products were also rejected. Subsequently several meetings were held between BLM, NASA, and ESL in attempts to resolve these problems. These meetings were interspersed with numerous

letters and telecons by the involved parties. In a period extending from July through November 1978 no agreement was ever obtained on the issue. Consequently a final meeting was scheduled for January 1979 to hammer out an agreement on what would be done by NASA and ESL to resolve this problem. At this meeting NASA and ESL conducted a thorough review of those actions they had taken to correct the deficiencies for which they had a responsibility. ESL also provided examples of products which they had revised. These products were reviewed by BLM and NASA and it was agreed that the products were far superior to those which had been initially submitted. At that point an ESL proposal to revise the remaining deficient products was reviewed. It was decided to have NASA fund ESL to complete the revision of these products. Subsequently NASA has issued a contract modification authorizing ESL to complete the revision of the phase 1 products. These revised products are to be delivered to the government at the ESL facility no later than April 1, 1979.

6.1.2 Seiscom Delta Products

It is important to realize that prior to the initiation of the BLM-NASA remote sensing project, there had never existed a requirement to produce output products from

Landsat which could be used in actual operational programs. Past efforts in this area had been devoted to producing high quality photographic products for use in scientific reports. As a result neither NASA, BLM, or the contractor-ESL Inc. - should be needlessly faulted for the failure to immediately produce high quality map products. In fact it was not possible, given our state of knowledge, at the beginning of this program to write the specification for output products which has recently been developed by DSC. The preceeding information is presented here as a means of introducing the topic of cartographic quality output products. The seeming debacle on phase 1 products had the very positive effect of forcing BLM to take a serious look at alternative means of acquiring output products. Once this initiative was taken it was almost immediately discovered that at least one organization had developed a technique to produce high quality map products. The Digital Images Division of Seiscom Delta, Inc. was that organization. This organization has produced numerous products from Landsat for USGS and NASA as well as other commercial organizations and State governments.

Since the real requirement in this project is for cartographic quality output products, and since this organization has the capability to rapidly produce

such products; BLM has made contractural arrangements through the NASA Jet Propulsion Laboratory (JPL) to produce an independent set of output products for the phase 1 program. A very detailed specification for this work has been prepared by DSC and reviewed in detail by Seiscom Delta. Both parties agree to the specification and as a result, work on developing these products has been initiated. These products are scheduled to be completed and delivered to BLM by the middle of February 1979.

6.1.3 Phase 2 and 3 Products

Products for these phases of the project will be made using the Seiscom Delta approach. NASA has instructed ESL that they are not to spend any funds on the development of products for phase 2. BLM is currently investigating the possibility of developing a contract to obtain cartographic quality products for these phases of the program.

APPENDIX

CLASS NO. _____

DATE _____

LANDSAT NO. _____

SCENE/NAME _____

NO. OF CLASSES _____

I. AREA

Acres 177 000

Hectares 71 632

Percent 7.25

II. PHOTO SAMPLES

Number _____

Percent _____

III. GROUND SAMPLES

Number _____

Percent _____

IV. COVER TYPE

Level I Shrub

Level II Low Shrub

Level III Low shrub with a woody mesic tundra component

Level IV Dwarf birch/willow

V. DESCRIPTION

Dominant dwarf birch community with intermixed low shrub willow and small pockets of white and black spruce. Alder and tall willow are scattered within the unit. There is a strong woody mesic tundra ground layer dominated by labrador tea and blueberry.

VI. ASSOCIATED VEGETATION

APPENDIX

CLASS NO. _____

DATE _____

LANDSAT NO. _____

SCENE/INAVE _____

NO. OF CLASSES _____

I. AREA

Acres _____ 177 000

Hectares _____ 71 632

Percent _____ 7.25

II. PHOTO SAMPLES

Number _____

Percent _____

III. GROUND SAMPLES

Number _____

Percent _____

IV. COVER TYPE

Level I _____ Shrub

Level II _____ Low Shrub

Level III _____ Low shrub with a mossy mesic tundra component

Level IV _____ Dwarf birch/willow

V. DESCRIPTION

Dominant dwarf birch community with intermixed low shrub willow and small patches of white and black spruce. Alder and tall willow are scattered within the unit. There is a strong mossy mesic tundra ground layer dominated by labrador tea and blueberry.

VI. ASSOCIATED VEGETATION

VII. ENVIRONMENT

Elevation: Ranges from 2400 feet (732m) to 3000 feet (915m)

Slope: 1° or less with some vegetation on slopes up to 15°

Aspect: Uniform

Drainage: Poorly to moderately well drained

Remarks on Environment:

VIII. GEOGRAPHIC AREA

IX. COVER PERCENT

	Mean	Standard Deviation
Conifer	4.00	
Deciduous	0.50	
Alder	1.00	
Willow	16.00	
Dwarf Birch	20.00	
Ground Layer	46.00 (moss, lichens)	
Non-vegetative	12.00	

VII. ENVIRONMENT

Elevation: Ranges from 2400 feet (732m) to 3000 feet (914m)

Slope: 1° or less with some vegetation on slopes up to 18°

Aspect: Uniform

Drainage: Poorly to moderately well drained

Remarks on Environment:

VIII. HYDROLOGIC AREA

IX. COVER PERCENT

	Mean	Standard Deviation
Conifer	4.00	
Deciduous	0.50	
Alder	1.00	
Willow	15.00	
Dwarf Birch	20.00	
Ground Layer (moss, lichens)	15.00	
Non-vegetative	15.00	

X. LARGE SCALE PHOTO/GROUND TYPE

(Level III call)

1.	Dense Conifer	_____	10.	Prostrate Shrub	_____
2.	Open Conifer	_____	11.	Woody Mesic Tundra	_____
3.	Dense Deciduous	_____	12.	Nonwoody Tundra	_____
4.	Sparse Deciduous	_____	13.	Wet Tundra	_____
5.	Deciduous Mixed	_____	14.	Wetlands	_____
6.	Coniferous Mixed	_____	15.	Water	_____
7.	Low Shrub	_____	16.	Ice/Snow	_____
8.	Tall Shrub	_____	17.	Bare Rock	_____
9.	Fellfield	_____	18.	Bare Soil	_____

XI. ASSOCIATED COMPUTER CLASSES WITHIN SCENE

_____

_____

_____

_____

XII. SOURCE OF TRAINING STATISITCS

_____

_____

_____

_____

XIII. ASSOCIATED COMPUTER CLASSES WITH OTHER SCENES OR PROCESSES

BLM-1 _____

BLM-2 _____

BLM-3 _____

BLM-13 _____

XIV. REMARKS

This unit forms an ecotone between the upland vegetation types of alder and tall willow; and the lowland vegetation types of black spruce, laborador tea, and blueberry. The unit provides cover and some limited winter browse habitat for moose. Provides cover habitat for caribou. The dynamic hydrology of the unit limits its utility for trails and other engineering considerations.

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